WHAT IS CLAIMED IS:

1. A composite structure comprising:

a nonelastomer substrate having a surface bearing a first recess;

a flexible elastomer membrane overlying the non-elastomer substrate, the membrane able to be actuated into the first recess; and

a layer overlying the flexible elastomer membrane.

2. The composite structure of claim 1 wherein the layer comprises an elastomeric material.

3. The composite structure of claim 1 wherein the layer comprises a non-elastomeric material.

4. The composite structure of claim 1 wherein the layer defines a second recess overlying the membrane and crossing-over the first recess, such that a variation of a pressure in the channel causes the membrane to be actuated into the first recess.

5. The composite structure of claim 1 wherein the first recess comprises a channel.

6. A composite structure comprising:

an elastomer component including at least one of a recess and a flexible membrane portion; and

a substantially planar nonelastomer component sealed against the elastomer component, the nonelastomer component including an active device interacting with at least one of the membrane portion and a material present in the recess.

7. The composite structure of claim 6 wherein the active device is an optical structure selected from the group consisting of a photodiode, a fiber optic device, [illegible]

[illegible]

electromagnetic spectrum.

8. The composite structure of claim 6 wherein the active device is an electronic structure selected from the group consisting of a resistor, a capacitor, a transistor, a chemical field effect transistor, a amperometric/coulometric electrochemical sensor, an accelerometer, a pressure sensor, a flow sensor, an electronic logic structure, a microprocessor, a chemical sensor, a strain gauge, an inductor, an actuator, a coil, a magnet, an electromagnet, a magnetic sensor, a radio frequency source, a radio frequency receiver, a microwave frequency source, a microwave frequency receiver, a radioactive particle counter, and an electrometer.

9. The composite structure of claim 6 wherein the active device is a thermal structure selected from the group consisting of a thermistor, a Peltier cooler, and a resistive heater.

10. The composite structure of claim 6 wherein the active device is an electrode that electrostatically drives the membrane portion into the recess.

11. A method of fabricating a composite structure comprising:

forming a recess in an elastomer component;

forming a substantially planar nonelastomer component including an active device; and

sealing the elastomer component against the nonelastomer component, such that the active device may interact with at least one of a flexible membrane portion of the elastomer component and a material present within the recess.

12. The method of claim 11 wherein the elastomer component is sealed against the elastomeric component by formation of a Van der Waals chemical bond.

13. The method of claim 11 wherein the elastomer component is [illegible] and the liquid layer is

14. The method of claim 11 wherein the elastomer component is sealed against the nonelastomer component by formation of a covalent chemical bond.

15. The method of claim 11 wherein the elastomer component is sealed against the nonelastomer component by formation of an ionic chemical bond.

16. The method of claim 11 wherein the active device formed in the nonelastomer component is an optical structure selected from the group consisting of a photodiode, a fiber optic device, a fiber optic interconnect, a light emitting diode, a laser diode, vertical cavity surface emitting laser (VCSEL), a micromirror, a CMOS imaging array, a CCD camera, a waveguide, and a source or a receiver for visible, infrared, or ultraviolet regions of the electromagnetic spectrum.

17. The method of claim 11 wherein the active device formed in the nonelastomer component is an electronic structure selected from the group consisting of a resistor, a capacitor, a transistor, a chemical field effect transistor, a amperometric/coulometric electrochemical sensor, an accelerometer, a pressure sensor, a flow sensor, an electronic logic structure, a microprocessor, a chemical sensor, a strain gauge, an inductor, an actuator, a coil, a magnet, an electromagnet, a magnetic sensor, a radio frequency source, a radio frequency receiver, a microwave frequency source, a microwave frequency receiver, a radioactive particle counter, and an electrometer.

18. The method of claim 11 wherein the active device formed in the nonelastomeric component is a thermal structure selected from the group consisting of a thermistor, a Peltier cooler, and a resistive heater.

19. The method of claim 11 wherein the active device is formed in the nonelastomeric component by a technique selected from the group consisting of PCB technology, CMOS, surface micromachining, bulk micromachining, printable polymer electronics, Thin Film Transistor, and other amorphous/polycrystalline material techniques.

microfabricating a first elastomeric layer including a recess-bearing face

microfabricating a second elastomeric layer including a recess-bearing face and a non-recess-bearing face;

placing the first elastomeric layer against the second elastomeric layer; and

bonding the first elastomeric layer to the second elastomeric layer.

21. The method of claim 20 wherein the recess-bearing face of the second elastomeric layer is placed against the non-recess-bearing face of the first elastomeric layer.

22. The method of claim 20 wherein the recess-bearing face of the second elastomeric layer is placed against the recess-bearing face of the first elastomeric layer.

23. The method of claim 20 wherein the non-recess-bearing face of the second elastomeric layer is placed against the non-recess-bearing face of the first elastomeric layer.

24. A method of forming a composite structure comprising:

forming a recess in a first nonelastomer substrate;

filling the recess with a sacrificial material;

forming a thin coat of elastomer material over the nonelastomer substrate and the filled recess;

curing the elastomer to form a thin membrane; and

removing the sacrifical material.

25. The method of claim 24 further comprising forming a further elastomer structure over the thin membrane.

26. The method of claim 24 further comprising forming a second nonelastomer stubstrate over the thin membrane.

[illegible] The method of claim 24 further comprising forming an active

[illegible]

interconnect, a light emitting diode, a laser diode, vertical cavity surface emitting laser [illegible] CMOS [illegible] a CCD camera, a waveguide, and a

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source or a receiver for visible, infrared, or ultraviolet regions of the electromagnetic spectrum.

28. The method of claim 24 further comprising forming an active device in the first nonelastomer substrate, wherein the active device is an electronic structure selected from the group consisting of a resistor, a capacitor, a transistor, a chemical field effect transistor, a amperometric/coulometric electrochemical sensor, an accelerometer, a pressure sensor, a flow sensor, an electronic logic structure, a microprocessor, a chemical sensor, a strain gauge, an inductor, an actuator, a coil, a magnet, an electromagnet, a magnetic sensor, a radio frequency source, a radio frequency receiver, a microwave frequency source, a microwave frequency receiver, a radioactive particle counter, and an electrometer.

29. The method of claim 24 further comprising forming an active device in the first nonelastomer substrate, wherein the active device is a thermal structure selected from the group consisting of a thermistor, a Peltier cooler, and a resistive heater.

30. The method of claim 24 wherein an active device is formed in the nonelastomer substrate by a technique selected from the group consisting of PCB technology, CMOS, surface micromachining, bulk micromachining, printable polymer electronics, Thin Film Transistor, and other amorphous/polycrystalline material techniques.